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THE

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[*Authors alone are responsible for all Opinions expressed in their Communications.*]

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III.

INJURIOUS INSECTS AND OTHER ANIMALS OBSERVED IN IRELAND DURING THE YEAR 1910.

By GEORGE H. CARPENTER, B.SC., M.R.I.A., F.E.S.; Professor of Zoology in the Royal College of Science for Ireland; President of the Association of Economic Biologists; and Consulting Entomologist to the Royal Dublin Society.

(Plates III.–VII.)

[Read, June 27; Received for Publication, June 27; Published, September 2, 1911.]

CORN INSECTS.

Crane-flies.

Tipula oleracea (Linn.) and other species.

Every year a vast amount of damage to the roots of corn crops is done by the "leather-jacket" grubs (see 2, pp. 197–9, etc.) of these flies. During the autumn of 1910, complaints were received of their ravages in Co. Wexford. In one case the observation was made that barley sown on grub-infested land suffered hardly at all, whereas an oat crop on the same area in the previous year had been almost destroyed by the larvæ.

The Corn Aphid.

Siphonophora granaria, Kirby.

Ears of wheat infested with specimens of this aphid were received from Co. Wicklow at the end of July. This insect, though known for very many years, does not seem to be often injurious either in Ireland or in Great Britain.

The virgin females of the summer broods are the forms of the species most often seen. These multiply at a great rate during the warmer seasons of the year, producing active young, which are developed within the mother's body from unfertilized eggs. The wingless virgin female has a brown head, a green, black-

spotted body, and yellowish legs with dusky thighs and feet. In the winged female the coloration is somewhat similar, but the thorax is brownish. In all cases the cornicles, on the abdomen, are black and, as is usual in the genus Siphonophora, very long and prominent.

Considerable damage is caused when these aphids establish themselves between the flowers of the ear and suck sap from the growing grains, causing them to shrivel and wither. The injury has been described in some detail by Ormerod (10, 1892, pp. 41–5; 1894, p. 24–7), who suggested that the clearance from "headlands" of the wild grasses, on which it might be presumed that the winter eggs were laid, should prove useful as a preventive measure. Spraying when the aphids are in protected situations between the ears could not be recommended.

CABBAGE AND TURNIP INSECTS.

The Cabbage Fly.

Phorbia brassicæ, Bouché.

Every year complaints of this destructive insect abound. In June, 1910, the maggots were found eating the roots of young cabbages at two localities in Co. Cork and at Banbridge in Co. Down; while in August specimens were sent from localities so widely separated as New Ross and Belfast. An account of the insect was given early in this series of papers (2, pp. 141–4).

Some other Crucifer-eating Diptera.

Cecidomyia sp. and *Scaptomyza flaveola*, Mg.

Some Swede-turnips with maggots of Phorbia were sent in July from Dundalk by Mr. A. W. Oldershaw. This observer had through the summer noticed curious deformations in the growth of the Swedes, and had sent some of his material to Mr. F. V. Theobald, of Wye College, Kent. Theobald has given some account of the case in a recent report (15, pp. 90–1, pls. xli., xlii.). He describes a gall-midge larva (Cecidomyid) feeding between the bases of the leaf-stalks, and giving rise to a peculiar gall-like swelling just above the roots. I succeeded in finding similarly

situated larvæ causing the same kind of damage (Plate III.). Theobald was able to observe that these grubs pupate in the soil; but he only succeeded in rearing a single midge, which the Abbé Kieffer believes to be referable to a new species.

The grub is 3 mm. ($\frac{1}{8}$ inch) long, and about ·65 mm. broad, of the usual cecid shape, and creamy-white in colour. The ventral "anchor-process" or "breast-bone" is very deeply emarginate in

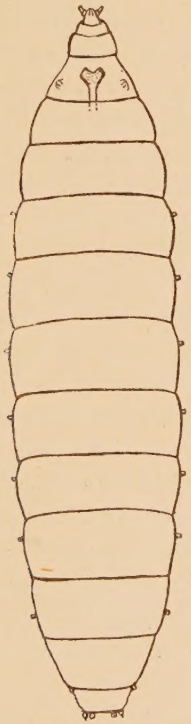

Fig. 1.—Larva of Turnip Cecid. Ventral view. Magnified 30 times.

front, with prominent quadrate side-outgrowths; this front part of the anchor-process is strongly chitinised and deep yellow in colour. The prothoracic spiracles are situated dorsally; the abdominal spiracles, as usual in the family, are lateral. At each side of the hindmost segment are two minute rounded tubercles, the outer pair carrying short spines (fig. 1).

We must hope that the Abbé Kieffer will soon be able to

identify this interesting insect for us. There is no doubt that the basal swelling of the shoots must be attributed, as Theobald states, to the presence of these cecid larvæ between the leaf-stalks.

The leaves of these swedes showed a most curiously deformed growth, being crumpled and blistered. On many of them were feeding small white muscoid larvæ (Plate IV.), which pupated on the plants, and which in September developed into small yellow flies (Plate V. B). These I believed to be *Scaptomyza flaveola*, Meig., and my opinion has been confirmed by Mr. P. H. Grimshaw, of the Royal Scottish Museum. He has also kindly identified a smaller grey fly reared from the same plants as *S. graminum*, Fallen. Theobald reared, from the Dundalk swedes that he received, another species of small fly, *Phytomyza flavicornis*, whose maggot burrows in the leaf-stalk and midrib.

The stunted growth of the shoots and the curious crumpled deformation of the leaves has led Mr. Oldershaw to apply the term "cabbage-headed" to these turnips. Whether, as Theobald suggests, the cecid larvæ must be held accountable for the damage, or whether the Scaptomyza maggots cause the leaf-deformation, may perhaps be decided this year by further study. Certainly towards autumn the Phorbia maggots become very destructive, and the crown of the root is largely eaten into by them. The tissues decay, and then certain scavenging Diptera lay eggs in the decomposing mass. In February of this year, a number of flies of the common *Homalomyia canalicularis*, Linn., were reared from this material, their well-known larvæ, whose segments are adorned with fantastic processes, having fed through the winter on the rotting roots and leaf-stalks. The tiny *Phora rufipes*, Meig., was also reared in the same way.

Coquillet (7) and Chittenden (5, pp. 75-6) have recorded the maggots of *Scaptomyza flaveola* and *S. graminum* as mining in the leaves of turnips and cabbages in the United States. In the present instance these larvæ were found on the surface of the leaves, which showed no blisters such as are caused by miners. I have recently given a somewhat detailed account (4), with figures, of these interesting species. From this account I give here a few details of the Scaptomyza larva and puparium.

The maggot (fig. 2) measures 3 mm. in length, and is of the

tapering form and whitish colour usual in muscoid larvæ. The head region (fig. 2 *c*) shows the typical anterior processes, and the rugose areas before and behind the mouth-hooks; the latter are

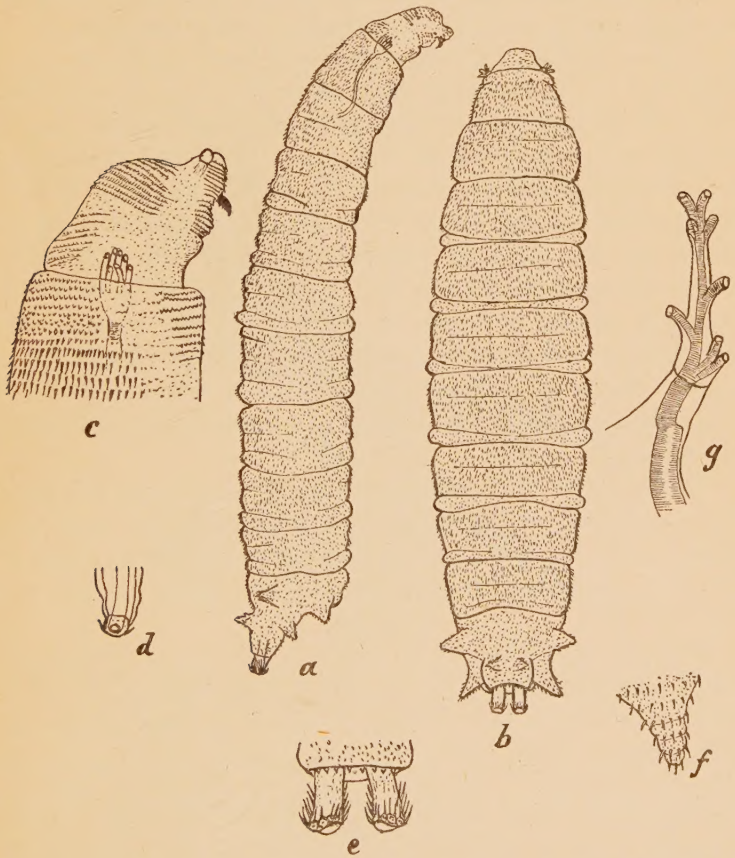

Fig. 2.—Larva of *Scaptomyza flaveola*; (*a*) side view; (*b*) dorsal view. Magnified 30 times. (*c*) anterior end, showing mouth-hooks, spiracles, and armature of cuticle. Magnified 80 times. (*d*) posterior spiracle, lateral view; (*e*) posterior spiracles, dorsal view; (*f*) postero-lateral process. Magnified 80 times. (*g*) anterior spiracular process of puparium. Magnified 120 times.

provided with three or four sharp teeth. Each prothoracic spiracle (fig. 2 *c*) consists of seven or eight open tubes of varying lengths, which arise irregularly from a common trunk, and are clustered

together like the fingers of a hand. The appearance of the spiracle differs markedly from the regular fan-like form that is familiar in the maggots of Musca, Calliphora, and their allies.

A remarkable feature in this larva is the presence of numerous short spines or fine hair-like outgrowths of the cuticle on all the body-segments (fig. 2 *a*, *b*, *c*). These are most prominent on the dorsal aspect. Towards the front edge of a segment one finds minute, short, stout spines; these soon give place to more elongate hair-like structures, which are arranged in fairly regular transverse rows. The hindmost segment of the larva bears four pairs of conical processes—one dorsal and vertical, two lateral, and two ventral (fig. 2 *a*, *b*); these processes are beset with fine, curved bristles arranged in whorls (fig. 2*f*). The tail spiracles are situated at the end of a pair of prominent tubes, which project from below a toothed, dorsal ridge on the hindmost segment (fig. 2, *b*, *d*, *e*). The sides of these tubes and the circumference of their extremities are beset with numerous, rather long bristles, backwardly directed (fig, 2, *d*, *e*).

The puparium of Scaptomyza (Plate V. A) is remarkable for the great elongation of the prothoracic spiracles, which project on either side of the head region like stags' antlers, to which the branching air-tubes give them, indeed, some resemblance (fig. 2 *g*).

Most students of British economic entomology will remember Curtis' description (8, p. 84) of the "Yellow Leaf-miner" of the Turnip—*Drosophila flava*, Fallen. Curtis gives a small-scale figure of the maggot of this insect, showing clearly the elongate tail-spiracular processes. He also figures the puparium, and calls attention to the "two divaricating horns on its head." Curtis' *Dropsophila flava* is now placed in the genus Scaptomyza, so that it is nearly allied to the insect under discussion.

Cabbage White Butterflies.

Pieris brassicæ (Linn.) and *P. rapæ* (Linn.).

The caterpillars of these well-known insects are every year injurious to cabbages in farms and gardens. My friend the Rev. W. F. Johnson wrote to me in October that he had noticed, during the preceding month, exceptional damage to cabbages in

the west of Co. Mayo (Westport, Clare Island, Achill) by the caterpillars of the larger species (*P. brassicæ*). Similar damage was noticed in Co. Down, whence I received also cabbage leaves covered with larvæ of the smaller species (*P. rapæ*).

These insects pass through two complete life-cycles in the year in our island, and are, therefore, said to be "double-brooded." It is the autumn brood of caterpillars, hatched from eggs laid by the August butterflies, that are usually, as in the past year, more

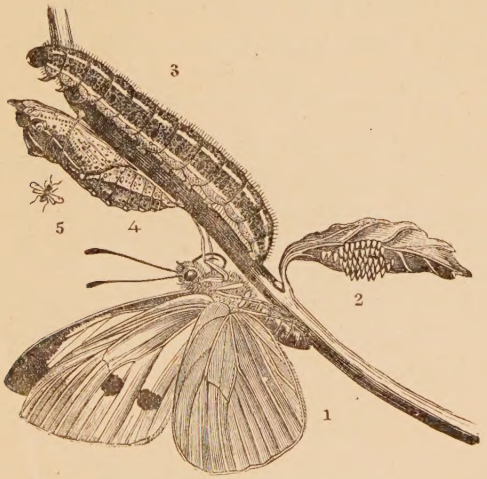

Fig. 3.—Large Cabbage White Butterfly (*Pieris brassicæ*); (1) female; (2) eggs; (3) caterpillar; (4) pupa; (5) small ichneumon fly whose grubs are parasitic in the caterpillars of Pieris. Natural size. From Ormerod's "Reports."

destructive than the June caterpillars, the offspring of the April and May butterflies, which emerge from wintering pupæ. Arsenical spraying would be considered inadvisable for cabbage-eating insects, and the only measures that can be recommended to the cultivator are hand-picking the feeding caterpillars, drenching heavily the attacked plants with water, and destroying the pupæ which may be found attached to walls and palings during winter and also in summer.

The Turnip Moth.

Agrotis segetum (Linn.).

Caterpillars of this moth, which had been following their usual

habit of feeding on the roots of turnips, were received from Co. Wexford at the end of August. The insect has been already described and figured in this series of papers (2, pp. 432-4).

MANGEL INSECTS.

The Mangel Fly.

Pegomyia betæ (Curtis).

The maggots of this fly were, as usual, destructive to the foliage of mangel crops in many parts of the country during the summer of 1910. Especially were complaints received from the midlands (Queen's Co.), and the west (Limerick) during July and August. Mr. W. Wibberley wrote from the latter locality giving his opinion that spraying with paraffin emulsion may be recommended to protect a well-grown crop from the attacks of the fly. The spray must, of course, act as a deterrent to egg-laying; it can have no effect in killing maggots, which, immediately after hatching, bore into the leaf-tissue where they are protected. A fairly full account, with figures, of this insect has been given in a previous paper of this series (2, pp. 289–291, pl. xxiii.).

POTATO INSECTS.

The Potato Flea-beetle.

Psylliodes affinis (Payk.).

Potato-leaves eaten by this beetle were received from Co. Louth in June. The insect has already been described and figured in this series of papers (2, pp. 254–5).

The Silky Beetle.

Dascillus cervinus (Linn.).

Two years ago I recorded the larvæ of this beetle as injurious to the roots of pastures and oats in Cos. Dublin and Wicklow (2, pp. 589–592, pl. lv.). It was of interest, therefore, to receive at the end of March specimens of larvæ from Co. Clare, which had been eating potato tubers.

The Ghost Swift Moth.

Hepialus humuli (Linn.).

Associated with the grubs of Dascillus, just mentioned, were caterpillars of the Common Swift moth. On three previous occasions I have recorded these caterpillars as injuring potato tubers in Ireland (2, pp. 195–7, 329, 434).

ORCHARD INSECTS.

The Garden Chafer.

Phyllopertha horticola (Linn.).

Specimens of this common beetle were received in June from Co. Wicklow, where they had done damage by devouring the leaves of raspberry canes. In certain seasons these insects become very numerous. They fly actively in sunshine, but in early morning and late evening they often rest on the leaves of trees, whence they can be shaken down on to boards or sheets, and killed by crushing, or by means of boiling water.

The Oblong Leaf Weevil.

Phyllobius oblongus (Linn.).

At the end of May and early in June complaints were received from Counties Down and Tyrone of damage done to young grafted apple-trees by these weevils, which appeared in large numbers and ate off the shoot-buds. Earlier in the season they had devoured the blossoms. Such is their usual course of operations, and, unless something be done to check their ravages, they will later in the year eat the developed foliage. Both Ormerod (11, pp. 141–5) and Theobald (14, p. 120) have remarked that "grafted plants in nurseries are noted as especially liable to attack."

Weevils of the genus Phyllobius are elongate insects, with parallel-sided elytra. The snout of the head is broad and rather short. *P. oblongus* is about 5 mm. ($\frac{1}{5}$ inch) long. The actual cuticle is black in colour, but, as it is clothed with brown or greyish scales and pubescence, the aspect of the weevil is pale; the

legs are brown or yellowish. These insects are active in sunshine, but in dull weather they rest sluggishly on the leaves, so that they can be shaken down, caught, and killed, as recommended above for the chafers. Theobald observes that grease-banding the grafts and shaking the beetles off the leaves is also effective, as when they crawl back they are caught on the bands. My correspondents

Fig. 4.—Oblong Weevil (*Phyllobius oblongus*). Magnified 6 times. From Ormerod's "Reports."

stated that dressings of lime, paraffin, and soot were useless. No application except lead arsenate wash could be recommended with any confidence; that would doubtless kill the weevils.

The grubs of Phyllobius are of the form usual among weevils, with soft, white cuticle, except the head, which is hard and brown. They live underground from the summer of one year to the spring of the next, feeding on roots.

The Codling Moth.

Carpocapsa pomonella (Linn.).

This is one of the most important of all the insects that have been recorded as injurious to apple, but it seems to be seldom that attention is drawn to it in Ireland. In the middle of June last year Mr. P. Quealy sent me from Newmarket-on-Fergus, Co. Clare, apples in which caterpillars of the Codling Moth were feeding, and he informed me that it was well known in that locality. He was

good enough to make diligent search for it in the district, and succeeded in finding it in a large number of orchards. In one only, however, did it appear to be seriously injurious; there two-thirds of the apples were spoiled by its ravages.

We are indebted to American workers for the best recent accounts of the Codling Moth. Slingerland (13), in his full and original paper, added many details to the general outline of the life-history that had been known for a century and more. His researches have been extended and supplemented by Simpson (12). In our own countries we have the shorter accounts given by Ormerod (11) and Theobald (14).

The Codling Moth is a member of the family Tortricidæ—insects of relatively small size, with comparatively broad wings and bluntly tipped palps. The larva in this family always feeds in a concealed situation, and the pupa, which has—like that of the more primitive Lepidoptera generally—some power of motion, emerges partly from the cocoon to allow the moth to escape. The genus Carpocapsa includes a number of species whose caterpillars feed inside fruits or seeds. *Carpocapsa pomonella* measures from 14–19 mm. ($\frac{3}{5}$–$\frac{3}{4}$ inch) across the outspread wings, which are prettily mottled with grey scales; the fore-wing shows an alternation of light and dark bands, and towards the tip there is a large, dark brown "eye-spot," with scales that show brilliant metallic-golden or coppery reflections (Plate V. c). The colour of the moths harmonizes well with that of the tree-bark on which they rest; they also spend some time on the leaves of the apple-trees. They are on the wing in April, and the eggs are laid mostly on the leaves (Simpson, 12, p. 26); occasionally, however, they are deposited on the side of the "receptacle" or part of the blossom which later develops into the fruit.

The eggs of the Tortricidæ are flat. That of the Codling Moth is oval in outline, measuring about 1·25 mm. by 1 mm. ($\frac{1}{20}$ by $\frac{1}{25}$ inch), and shows a beautifully reticulated surface (Plate V. D). Our knowledge of the egg is due mostly to the researches of Slingerland. A single female may lay from thirty to forty eggs. The young caterpillar is hatched about a fortnight after the egg has been laid, but the time varies considerably with the temperature (Simpson, 12, pp. 28–30).

By the time that the eggs are hatched, the petals have fallen from the blossoms and the young fruits are set. Each little caterpillar makes its way to the calyx end of a fruit, and eats its way thence to the core. If hatched from eggs laid on leaves, the caterpillars nibble the foliage on their way to a fruit. The track of a caterpillar from the calyx or "eye" end of a young apple to the core can be readily traced, and it is around the centre of the fruit that they mostly feed, often eating the seeds and ejecting their excrement through the entrance hole. The caterpillar (Plate V. E) has a black head and a firm dark shield on the first thoracic segment; the rest of the body is pale in colour, with dark bristle-bearing tubercles. When young it is usually white or yellowish; it may become pink as full growth is reached, but many larvæ remain whitish throughout. There are, according to Simpson, four moults or cuticle-castings and five stages in the life of the larva, which when fully grown measures about 18 mm. ($\frac{5}{4}$ inch) in length. In the United States the larval life lasts from three to four weeks, but in England and Ireland the duration is longer—seven weeks according to Theobald (14, p. 74). Consequently the caterpillars in these countries leave the fruit about midsummer. The tunnel by which the caterpillar eats its way out generally runs from the core to the side, where the "exit-hole" usually presents a conspicuous and unsightly appearance (Plate VII. A).

Having left the fruit, the caterpillar seeks for shelter where it can spin its cocoon and pupate. If the fruit has remained on the tree, the larva crawls along the twig and down the trunk; if, as often happens, the apple has fallen, the caterpillar frequently crawls up the trunk: for loose pieces of bark, moss, lichens, and similar objects on the tree-trunk are the favourite shelters beneath which the caterpillars creep, in order that they may spin their cocoons (Plate VI.).

In these countries, the caterpillars which spin their cocoons in midsummer usually rest unchanged throughout the autumn and winter, pupating only in the succeeding spring a few weeks before the emergence of the moths. That is to say, there is one life-cycle only in the year; the insect is single-brooded. This is also the case in North Central Europe, in Canada, and in the northernmost United States. But in the more southern regions of the European

continent, in Ontario, and in the greater part of North America, some or all of the larvæ which spin their cocoons at midsummer pupate quickly, and a second brood of moths appear in July and August. These lay eggs on the apples that may be still on the trees, fallen to the ground, or even stored in houses. The caterpillars that are hatched from the eggs of this second brood of moths eat their way into the fruit from the side (Plate VII. B)—not from the calyx end; and the damage done by these autumn caterpillars is, in those regions where they occur, far greater than that due to the spring brood. An exhaustive discussion of the two broods—and the possibility of a partial third brood—in North America will be found in the recent memoir by Simpson (12, pp. 41–57).

The occurrence of this second brood in the southern parts of our own islands has long been suspected, and Theobald has lately (14, p. 74) given definite records of the autumn caterpillars in Kent and Herefordshire. I am glad to be able to substantiate the presence—or at least the partial presence—of this second brood in the south of Ireland. On August 31st, 1910, I received from Bantry apples on which the characteristic side-entrance-hole was visible, and around whose cores young larvæ of Carpocapsa were feeding.

Fortunately the life-history of this insect enables the fruit-grower to take measures that check its ravages with considerable certainty. The natural shelters for the cocoons on the tree-trunk—such as loose bark, moss, &c.—should be removed by cleaning and winter washings, and artificial shelters provided by tying bands of rope or sacking around the trunks. These should be in place early in June, so as to be ready for the most forward caterpillars of the spring brood, and should be examined every week, the cocoons, with their contained caterpillars, being carefully removed and destroyed. This, if effectually carried out, will prevent the occurrence of a second brood of moths.

Another measure that has been found by experience to be of great value against the Codling Moth is spring spraying with lead-arsenate wash. It has been mentioned that the young spring caterpillars eat their way into the newly set apples at the calyx end. The object of the spraying is to provide a little nest of

arsenical poison which the caterpillar must eat as soon as it begins to attack the apple. Consequently spraying must be carried out while the blossom is still upright, a few days after the petals have fallen, and while the sepals are still expanded. By spraying at this time, it is ensured that a deposit of the arsenate is lodged at the top of the young fruit, ready for the caterpillar when it proceeds to eat its way in. Simpson recommends a second application of the spray a fortnight later, by which time the larvæ are active and on their way to the fruit.

The fact that this insect is not very common in Ireland should be an incentive to our fruit-growers to use their best endeavours to keep it under control. Further information as to the prevalence of the second brood in the south of Ireland would be especially valuable and welcome.

The Eyed Hawk Moth.

Smerinthus ocellatus (Linn.).

The large caterpillars of this moth have been previously recorded as injurious to apple orchards in Ireland (2, pp. 578–9, 602). Specimens were received at the end of August, 1910, from Queen's Co.

The Figure-of-eight Moth.

Diloba cæruleocephala (Linn.).

In June, Mr. W. S. Irving of the Department of Agriculture, forwarded some caterpillars of this moth which were devouring the foliage of apple-trees in Queen's Co. I have not before received complaints of this insect as injurious to Irish orchards, though it is widespread in the country. It has been recorded by Ormerod (11) and Theobald (14, pp. 35–8) as rarely harmful to apple foliage in Great Britain. It feeds also on other rosaceous trees—blackthorn, whitethorn, pear, plum, cherry, and peach.

This moth is a member of the family ~~Notodontidæ~~ Cucullidæ, to which belong the "Puss" moth and the various species known as "Prominents." It measures about 40 mm. ($1\frac{1}{2}$ inches) across the outspread fore-wings, which are purplish brown with darker transverse bands, each adorned on the disc with a greyish or

This moth is a Noctuid.

creamy-white mark resembling a figure 8. The feelers are light-brown, strongly comb-like in the male, but simple in the female. There is a distinct crest on the thorax. The moth is on the wing in autumn, usually during September and October. The female lays her eggs on the bark of the shoots singly, or in groups of from five to ten. The egg is cake-shaped, its firm coat being adorned with radiating ribs, and it remains unhatched through the winter.

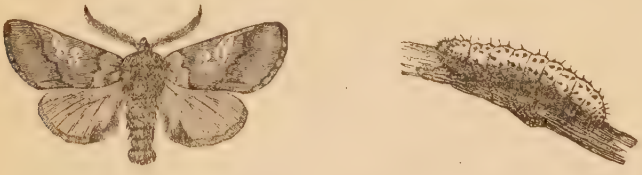

Fig. 5.—Figure-of-Eight Moth (*Diloba cæruleocephala*) and Caterpillar. Natural size. From Ormerod's "Reports."

The caterpillars appear in spring at the time of the opening of the foliage, on which they begin to feed, becoming fully grown about midsummer. Then the larva is about 25 mm. (1 inch) long, yellowish-green or bluish-grey in colour, with black spots and bristles, and a single dorsal and paired lateral yellow lines; the head is blue, with a pair of black spots. The pupal stage, which lasts from July till the autumn, is passed in a tough cocoon of silk, mixed with particles of earth or pieces of bark, for the caterpillar, before pupation, usually descends to the ground, where it buries or hides itself, but it sometimes remains on the tree.

From this brief account of the life-history it will be seen that the caterpillars of this moth are feeding at the same time as the far more destructive and better-known larvæ of the Winter Moth. The application of lead-arsenate spray is an effectual method for destroying both.

The Magpie Moth.

Abraxas grossulariata (Linn.).

The well-known and conspicuous caterpillars of this moth were sent at the end of May from a Dublin garden where they were reported as very destructive to currant bushes. Every year this common insect is more or less injurious all over the country,

and it feeds on a variety of shrubby plants. Theobald (14, p. 207) points out that it is most harmful in gardens "where the currants are trained against walls or fences," while growers of bush-fruit on a large scale "do not consider it of much importance."

This moth belongs to the family Geometridæ, which includes also the Winter Moth. While, however, in the latter and its near allies the female's wings are reduced or absent, Abraxas, in common with the vast majority of the genera of the Geometridæ, has both sexes with normally developed wings. The Magpie Moth, with its creamy-white wings with black spots and yellow bands and its yellow and black body, is so conspicuous that it must be familiar to all. It flies during July and August both in bright daylight and after sunset. The wing-expanse varies, but is usually about 36 mm. ($1\frac{1}{2}$ inches).

Fig. 6.—Magpie Moth (*Abraxas grossulariata*) and Caterpillar. Slightly enlarged. From Ormerod's "Reports." (By permission of the *Gardeners' Chronicle*.)

The female moth (distinguished from the male by her simpler feelers) lays her oval eggs in groups of twenty or more, but sometimes singly, on the leaves. From these eggs are hatched tiny black caterpillars—"loopers"—like all members of the Geometridæ, with only two pairs of abdominal pro-legs. These caterpillars feed for a short time on the leaves, but when only about $\frac{1}{4}$ inch long they cease to eat, and seek winter quarters among dead leaves on the bushes or the ground, in cracks of bark, or in the holes and chinks of brick or stone walls. In spring they come out of their shelters and begin to eat greedily the opening foliage. Soon they

assume the conspicuous characteristic livery of their kind—creamy-white with black and orange spots and stripes; the fully grown caterpillar measures 1½ inches in length, and is of rather stout build. When fully grown—about midsummer—the caterpillar spins a loose net-work cocoon among the twigs of its food-plants and changes into the conspicuous chestnut-brown, yellow-banded pupa, whence the moth emerges about a month later.

In cases of severe attack by these caterpillars, the branches are almost denuded of leaves. The damage is of course done between early spring, when the young larvæ come out of their winter-quarters, and midsummer, when they pupate. During most of this period they are so conspicuous that hand-picking is easy, and, for garden-work at least, this is the most readily effective means of destroying them. Obvious preventive measures—useful also against other harmful insects—are the removal of dead leaves and similar shelters from the bushes and the careful pointing of the walls to eliminate cracks. Spraying with lead arsenate is effective against this as against other biting insects, but the season of the caterpillars' activity may be too near the fruit-gathering time for the safe use of such poisons. Theobald (14, p. 211) states that on several occasions he has found that spraying with lead arsenate in autumn has killed off the young caterpillars, so that the insects have not appeared on the bushes in the succeeding spring.

The Slugworm Sawfly.

Eriocampoides limacina (Klug.).

An account, with figures, of this well-known insect was given in my account of Irish Injurious Insects for 1909 (3, pp. 19–20). It was again destructive during 1910, complaints being received in September of damage either to plum or pear from Dublin, Belfast, and Portadown.

FOREST INSECTS.

The Pine Bark Beetle.

Hylurgus piniperda (Linn.).

This destructive insect has been already described and figured

in this series of papers (2, pp. 443–6). Late in October, 1910, I received from Mr. E. W. L. Holt twigs of Scots Pine tunnelled by the beetles, as is their habit at that season of the year.

The Pine Chermes.

Chermes pini, Koch.

Shoots of Scots Pine, covered with the woolly colonies of this aphid, were sent in May by the Editor of the *Farmers' Gazette*, who had received them from a correspondent at Ballycastle, County Antrim. It was stated that the affected trees had been planted for ten years, and that the Chermes were first observed in March, 1910. Then only two or three trees were attacked, but during the succeeding two months, the insects had spread "to nearly all the trees in the plantation," so that the stems of some of them were almost covered with it. According to Burdon (1, p. 133), this species, whose virgin females are rather commonly observed on Pines, has probably asexual generation on the Spruce, like other members of the genus.

GARDEN INSECTS.

Springtails.

Lipura ambulans (Linn.).

Various seedlings damaged by springtails of this species were received from County Kildare in March. The insect has been described and figured (2, pp. 201–3) and several times subsequently mentioned in this series of papers (2, pp. 293–4, 298, 442). The importance of springtails as injurious insects is becoming more and more recognized, and a valuable paper on the subject, with a list of the harmful species, and interesting notes on their ravages, has been recently published by Theobald (15, pp. 111–127). Collinge also (6) has lately shown by experiment that these insects devour healthy roots and bulbs; he found that plants in pots where mould contained springtails sickened and died, while where springtails were excluded the plants flourished.

Wireworms.

Athous hæmorrhoidalis (Fab.).

Wireworms which proved to be larvae of the click-beetle *Athous hæmorrhoidalis* were received from County Tyrone, where they had devoured the roots of tomatoes in a greenhouse. Though less common than the well-known wireworm of Agriotes (from which it differs in the terminal segment being rough and bifid instead of smooth and pointed), the Athous grub is often destructive on farms. I had not previously met with it as destructive in a greenhouse. In such a restricted situation there is more chance than in an open field or garden of killing the wireworms by means of such an insecticide as vaporite. Possibly, also, the use of buried slices of beetroot as traps might be effective in alluring a number of the grubs.

The Lilac Leaf-miner.

Gracillaria syringella (Fab.).

Lilac-leaves injured by the caterpillars of this little moth were received from County Galway in September. The insect measures only 12 mm. ($\frac{1}{2}$ inch) across the outspread fore-wings, which are pale yellow, with white and dark spots and streaks. The insect has two broods in the year, the moth appearing in May and July, and the caterpillar feeding in June and again in the autumn. The caterpillars are pale green, with a brown head, and shelter themselves by mining in the leaves, which become disfigured by large blisters, each of which may contain as many as thirteen larvæ. The pupae are found in the axils of the bushes, or on neighbouring fences (Gillanders, 9, pp. 280–1).

STOREHOUSE INSECTS, &c.

The Tasmanian Storehouse Beetle.

Ptinus tectus, Boield.

This imported insect was first recorded from Ireland (feeding on almonds from Killiney, Co. Dublin) in a previous paper of this series (2, p. 587, pl. liv.). In December, 1910, I received some

specimens from Bray, Co. Wicklow, where they were eating stuffed specimens of birds. From this it appears that the insect can be readily introduced into a new locality, and that it can adapt itself to a great variety of food.

The Cheesemite.

Tyroglyphus siro (Linn.).

Late in August I received from Mr. J. Bracken, Horticultural Instructor, Co. Cork, a number of these well-known mites, which he had found on the floor of a beehive, containing no bees, but furnished with comb. The floor was covered with a dust consisting of minute fragments of the wax, among which multitudes of the mites were living and feeding. The great variety of substances—cheese, hay, meal, &c.—in which this mite and its near ally, *T. longior*, Gervais, feed would prepare the naturalist for their presence in beeswax.

Water-Worms.

Limnodrilus udekemianus, Claparède.

A curious case of inconvenience caused by worms was brought to my notice in March, 1909, by Mr. D. Twoomey, Agricultural Instructor, who forwarded from Roscrea a large number of worms taken from a farm drain. Though the drain measured in cross-section 6 inches by 4 inches, it had been completely blocked for a distance of 3 or 4 feet by a mass of these tiny worms; several shovelfuls of them were removed. Mr. R. Southern kindly identified the species—a small annelid worm belonging to the family Tubificidæ. Mr. Twoomey informed me that the worms were present in the drain just where it runs under a small flower garden, and that the only water passing through the drain was from the overflow of a pump. Mr. Southern tells me that individuals of this species have the habit of living together in large tangled masses, which accumulate slowly, and can offer great resistance to strain. The worms can live in water or in mud, but not in ordinary soil, and the presence of such masses might rather have been expected in a stagnant pond than in clear running water.

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EXPLANATION OF PLATE III.

PLATE III.

Larva of Cecid feeding between petiole-bases of turnip. Magnified.
[From Photograph by T. Price.]

EXPLANATION OF PLATE IV.

PLATE IV.

Deformed Turnip-leaf with maggot of *Scaptomyza flaveola* feeding. Magnified. [From Photograph by T. Price.]

EXPLANATION OF PLATE V.

PLATE V.

A. Puparium of *Scaptomyza flaveola*. Magnified.

B. *Scaptomyza flaveola*. Imago. Magnified.
[From Photographs by T. Price.]

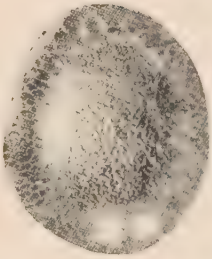
C. Codling Moth (*Carpocapsa pomonella*). Magnified four times.
[From Simpson, Ent. Bull. 41, U.S. Dep. Agric.]

D. Egg of Codling Moth. Highly magnified.
[From Simpson, after Slingerland.]

E. Caterpillar of Codling Moth. Magnified three times.
[From Simpson, Ent. Bull. 41, U.S. Dep. Agric.]

A

B



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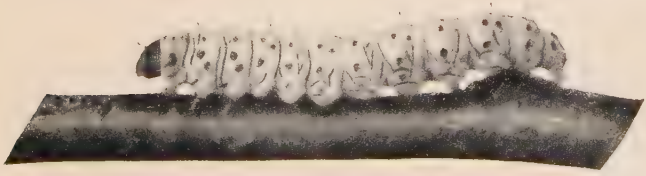

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EXPLANATION OF PLATE VI.

PLATE VI.

Pupæ and newly emerged Codling Moths on Bark. Slightly enlarged.

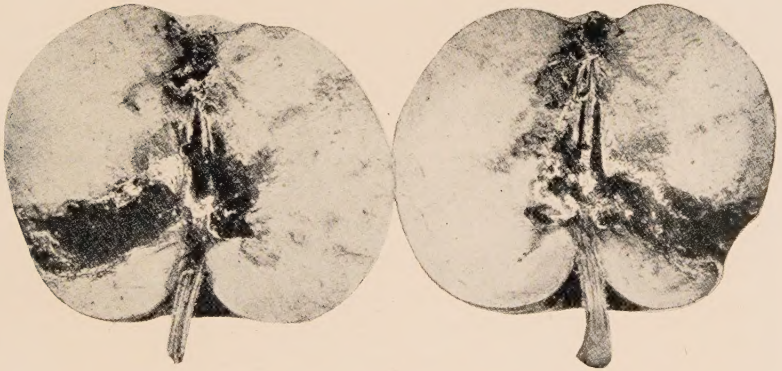
[From Simpson, Ent. Bull. 41, U.S. Dep. Agric.]

EXPLANATION OF PLATE VII.

PLATE VII.

A. Sectioned Apples injured by spring caterpillars of Codling Moth.
[From Sanderson, Bull. 131, New Hampshire College.]

B. Apples injured by autumn caterpillars of Codling Moth.
[From Sanderson, Bull. 131, New Hampshire College.]



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